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THE LEADER IN ENVIRONMENTAL TESTING

Incremental Sampling Methodology – Status Report on ITRC Guidance

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Chasing Uncertainty Sources

- Instrumental analysis

- Sample preparation

- Laboratory sub-sampling

- Field sample collection

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Does the decision unit fit in the sample jar?

Representative subsampling

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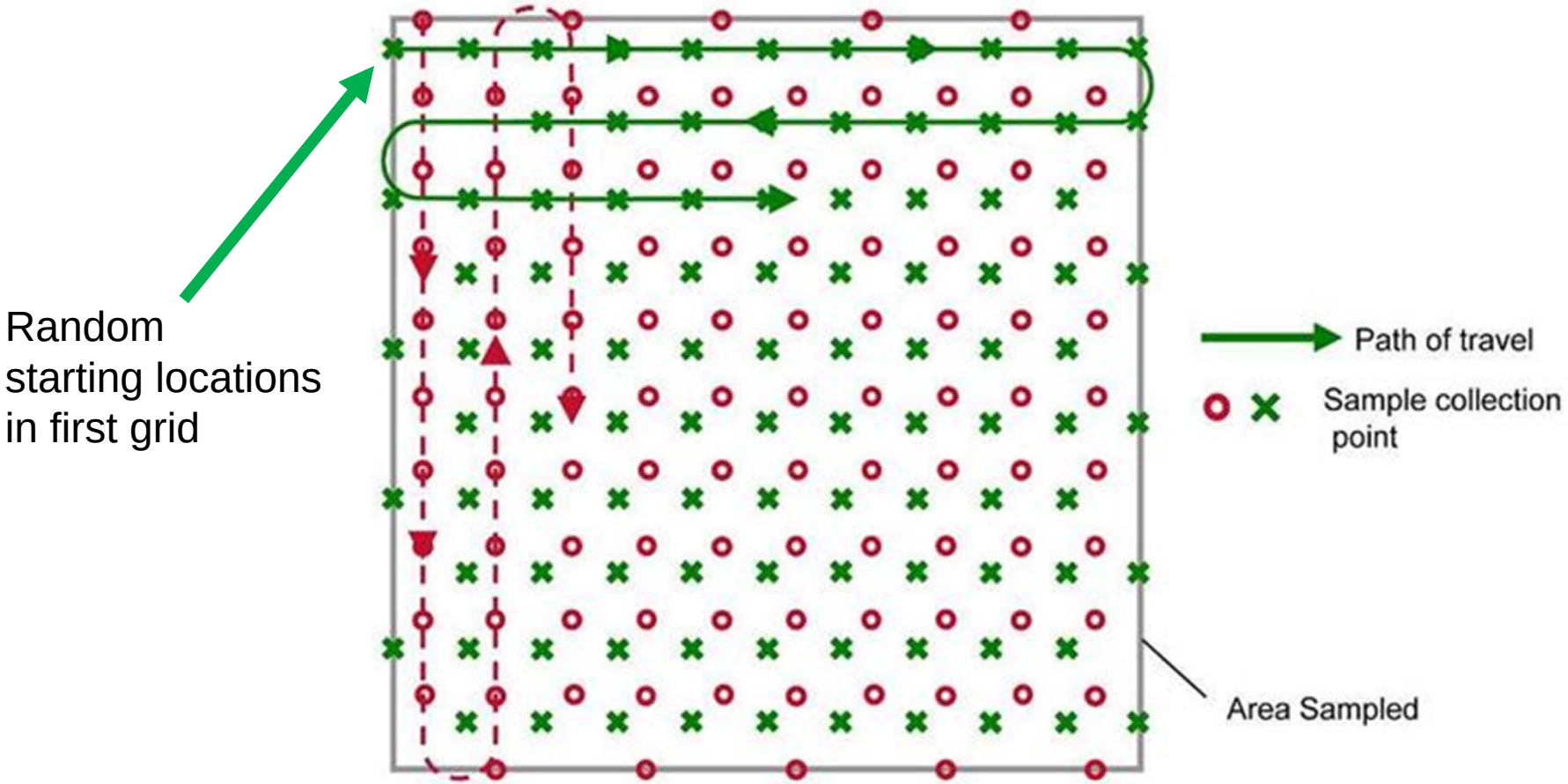
Incremental Sampling

- Systematic Random Design



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ITRC Developing Guidance

INTERSTATE TECHNOLOGY & REGULATORY COUNCIL
Advancing Environmental Solutions

- **Incremental Sampling Methodology Team**
  - ~ www.itrcweb.org/teampublic_MIS.asp
  - ~ Formed Jan. 2009

Disclaimer: Most of the material in this presentation has been derived from the Feb. 2011 draft guidance developed by the ITRC ISM team. ITRC does not endorse the use of specific vendors or technologies. This presentation is not official ITRC sanctioned training material. It has been reviewed by ITRC for compliance with the ITRC usage policy.

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ISM Guidance

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Introduction

- ISM for Environmental Sampling
- Limitations of Traditional Approaches
- ISM for Site Characterization
- Comparing ISM to Compositing
- Purpose
- Document Organization

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ISM Principles

- Introduction
- Foundation Concepts of Sampling
- Soil is Heterogeneous
- Types of Heterogeneity
- Gy Theory and the Source of Sampling Error
- Sampling Approaches
  - ~ (Discrete, Composite, Incremental)

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ISM Principles

Nature of Soil
&
Interaction of Contaminants With Soil

Results In

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ISM Principles

Heterogeneity

Sampling w/o addressing leads to

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ISM Principles

Sampling Errors

Manifested (observed) in

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ISM Principles

Unknown Data Variability

which can lead to

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ISM Principles

Decision Errors

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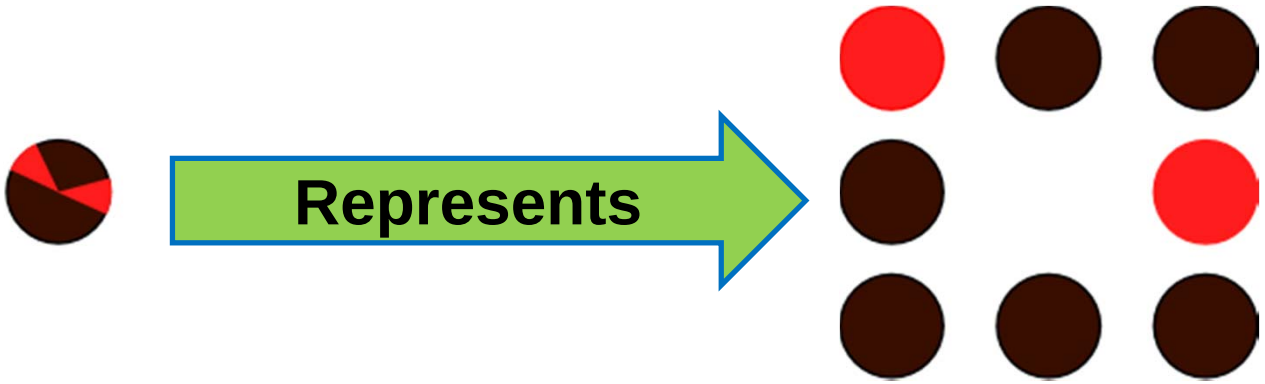
Representative Sample

A representative sample is one that contains a subset of all the constituents of a population in exactly the same proportion that they are present in the target population.



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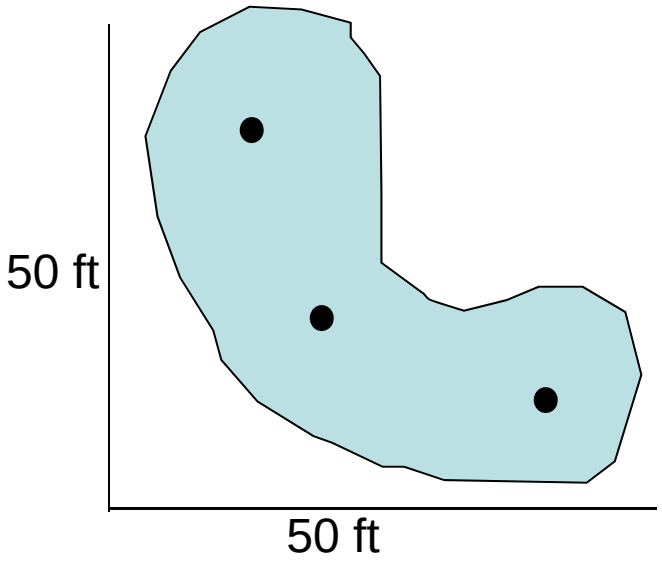
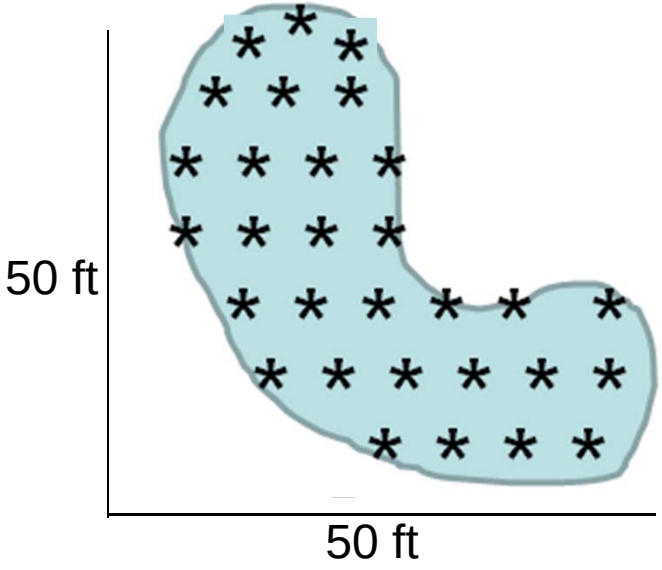
Representativeness

Which is more likely to represent the true mean?

Average (or UCL) from
3 discrete samples



One 30-increment sample



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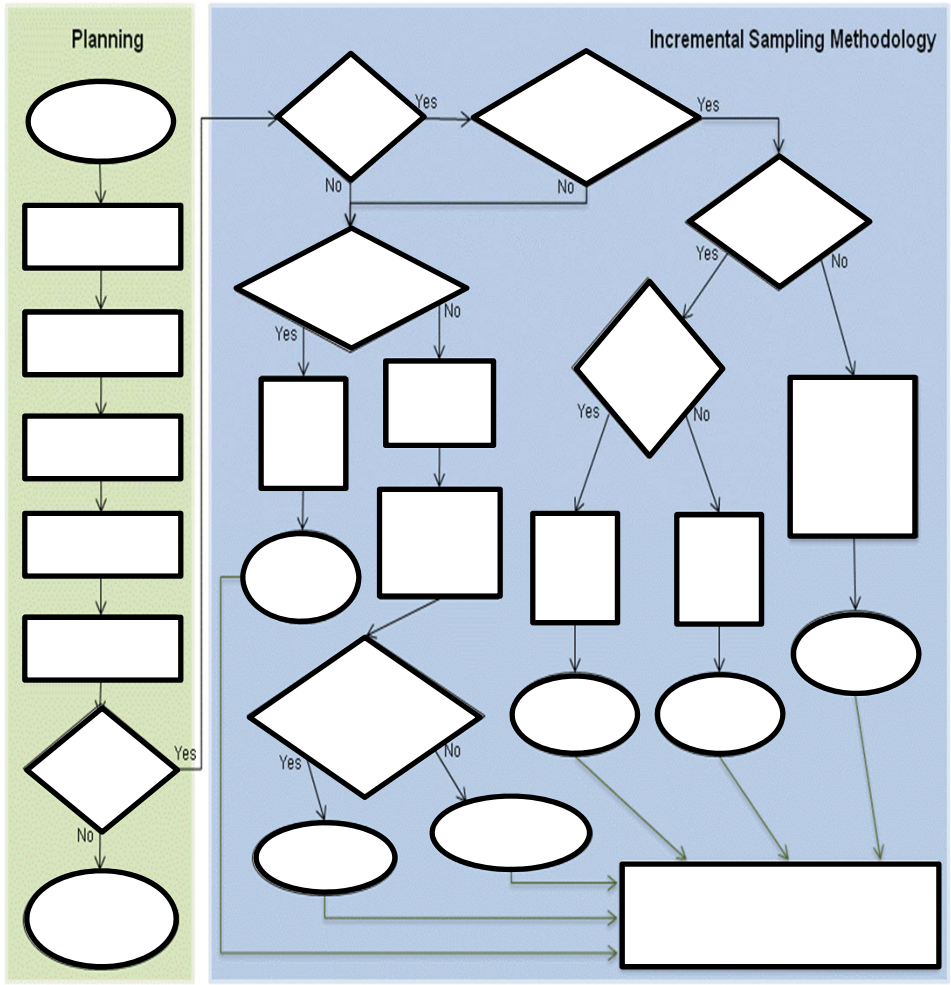
Systematic Planning Approach

- Introduction
- Conceptual Site Models
- Investigation Objectives
- Identify Data Needs
- Decision Units (DU)



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The Decision Unit: A Key Concept for ISM

- **Decision Unit (DU)** – smallest volume of soil (or other media) for which a decision will be made based upon ISM sampling. A DU may consist of one or more Sampling Units (SUs).

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Combined DUs

Future residential lots, DUs sized as exposure areas (EUs)

Pesticide mixing area, DUs sized to assist remediation

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Statistical ISM Design

- Estimating the Mean Concentration
- Uncertainty in Estimates of the Mean
- Evaluating the Performance of Sampling Approaches
- Areas for Further Study

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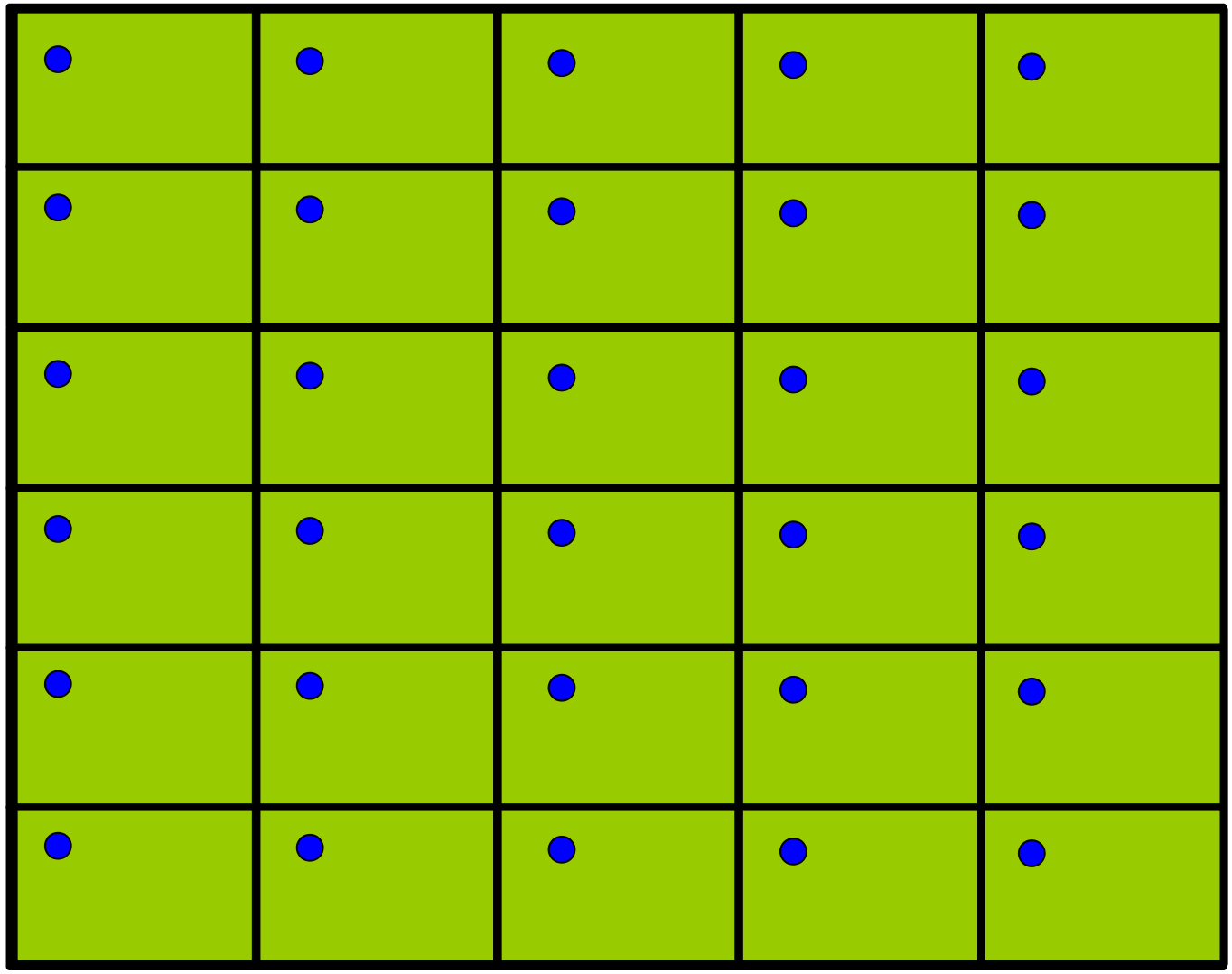
Systematic Random Sampling



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Field Implementation

- Introduction
- Sampling Tools
- Field Collection
- Field Processing Options

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Sampling Tools

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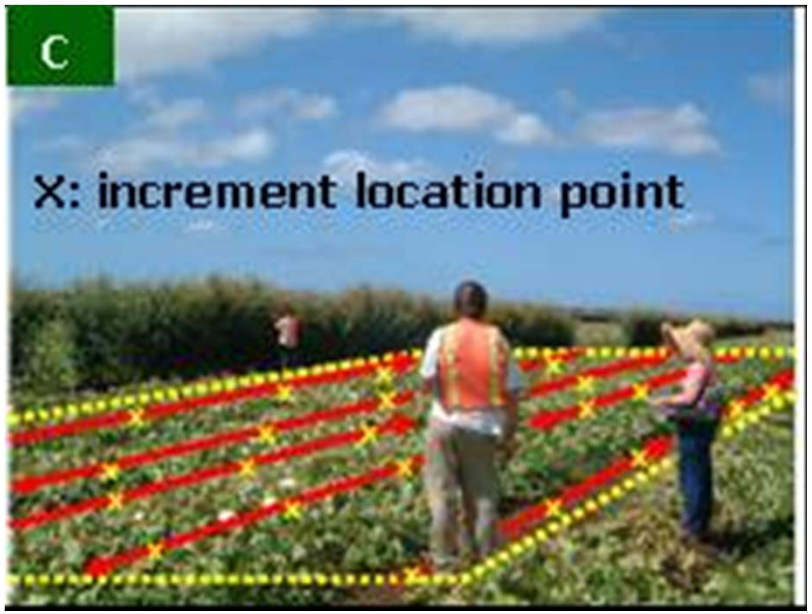
Surface Samples



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Volatile Organic Compound Sampling

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Laboratory Processing & Analysis

- Introduction
- Laboratory Processing
- Laboratory Analysis
- Quality Assurance

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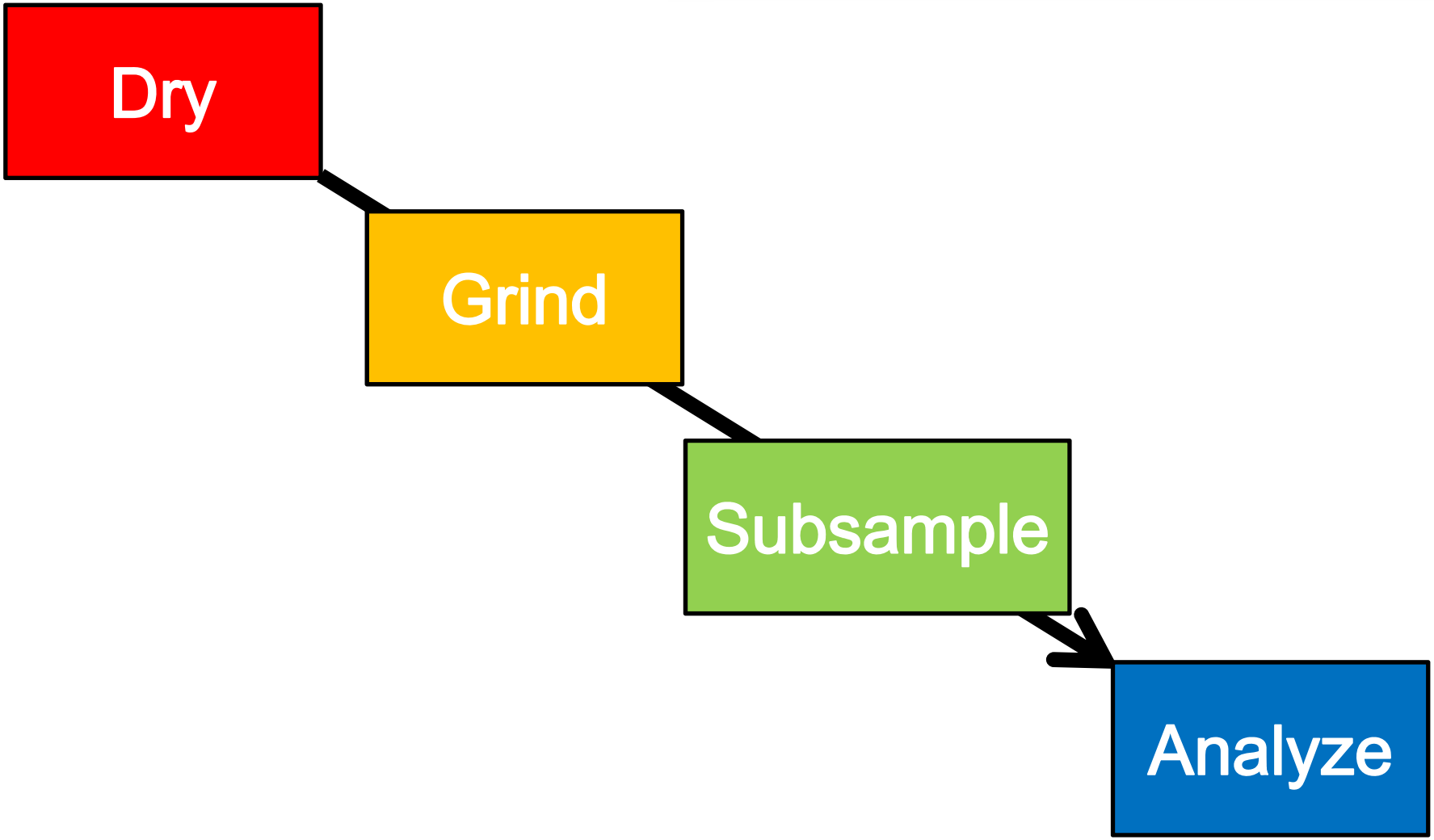
No Universal Lab Sample Processing



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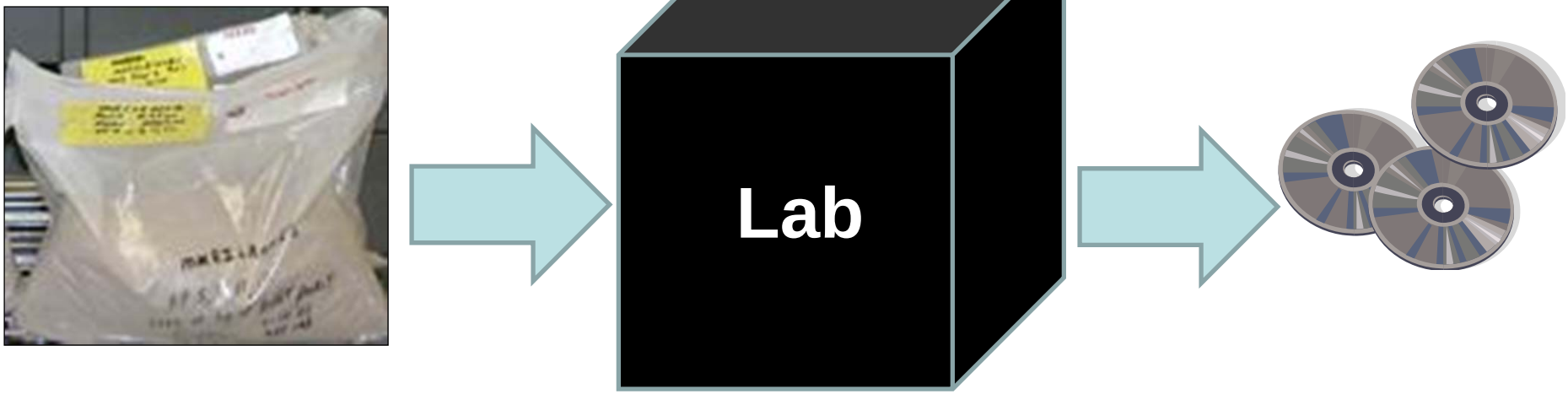
Include Lab Processing in Project Planning



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Sample Conditioning

- Air drying
  - ~ Room temperature - most common
  - ~ Ventilation hood
  - ~ Consider volatilization losses
    - ° Boiling point
    - ° Binding to soil particles (lower conc. > higher binding > lower losses)
    - ° Loss risk table
      - – naphthalene
      - – 2-methylnaphthalene
      - – acenaphthene
      - – dibenzofuran
    - ° Loss risk test (R&D)
  - ~ Goal: Crushable agglomerates

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Defining Terms

- Grinding:
  - ~ Generic term for soil disaggregation or milling. The grinding type or equipment must be specified to select a particular laboratory process.

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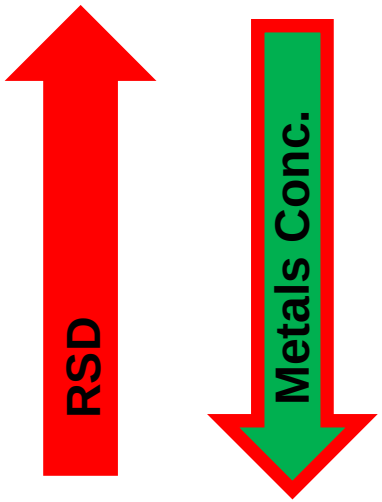
Defining Terms

- Disaggregating:
  - ~ Breaking the soil clumps into individual small particles, but keeping the small pebbles and hard crystalline particles intact.



Compared to milling

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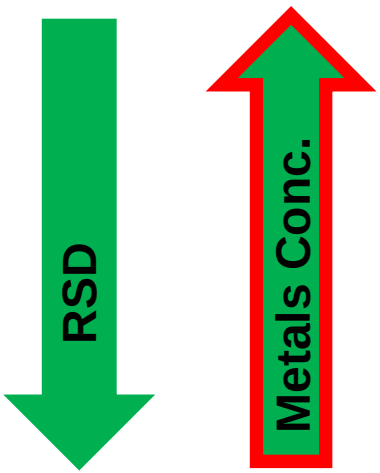
Defining Terms

- Milling:
  - ~ Complete particle size reduction of all soil components including hard crystalline materials to a defined maximum particle size (e.g. < 250 um or < 75 um).

Picture from USACE-Alan Hewitt



Compared to disaggregating

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Sub-sampling Options

- 2-Dimensional Japanese Slabcake

Dry

Wet

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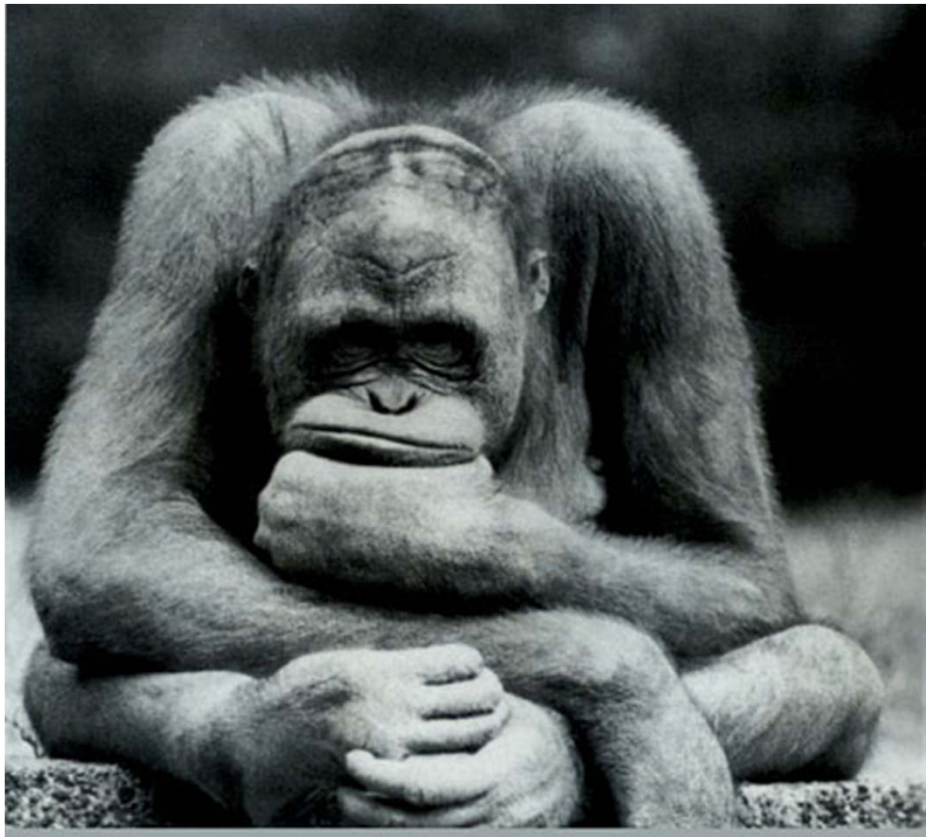
Making Decisions

- Introduction
- Options
- Error Assessment



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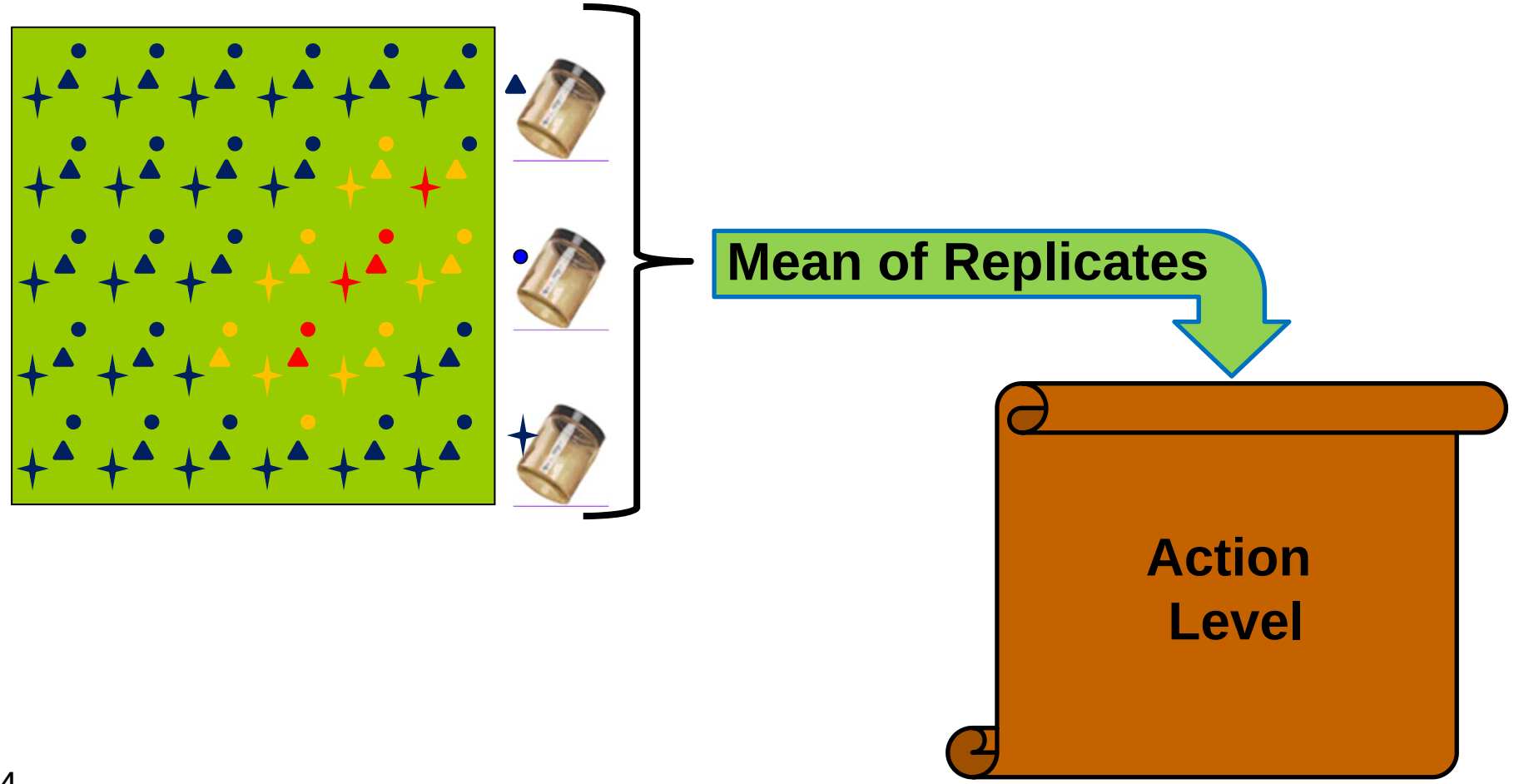
Compare Average ISM Result to Action Level

Decision Unit



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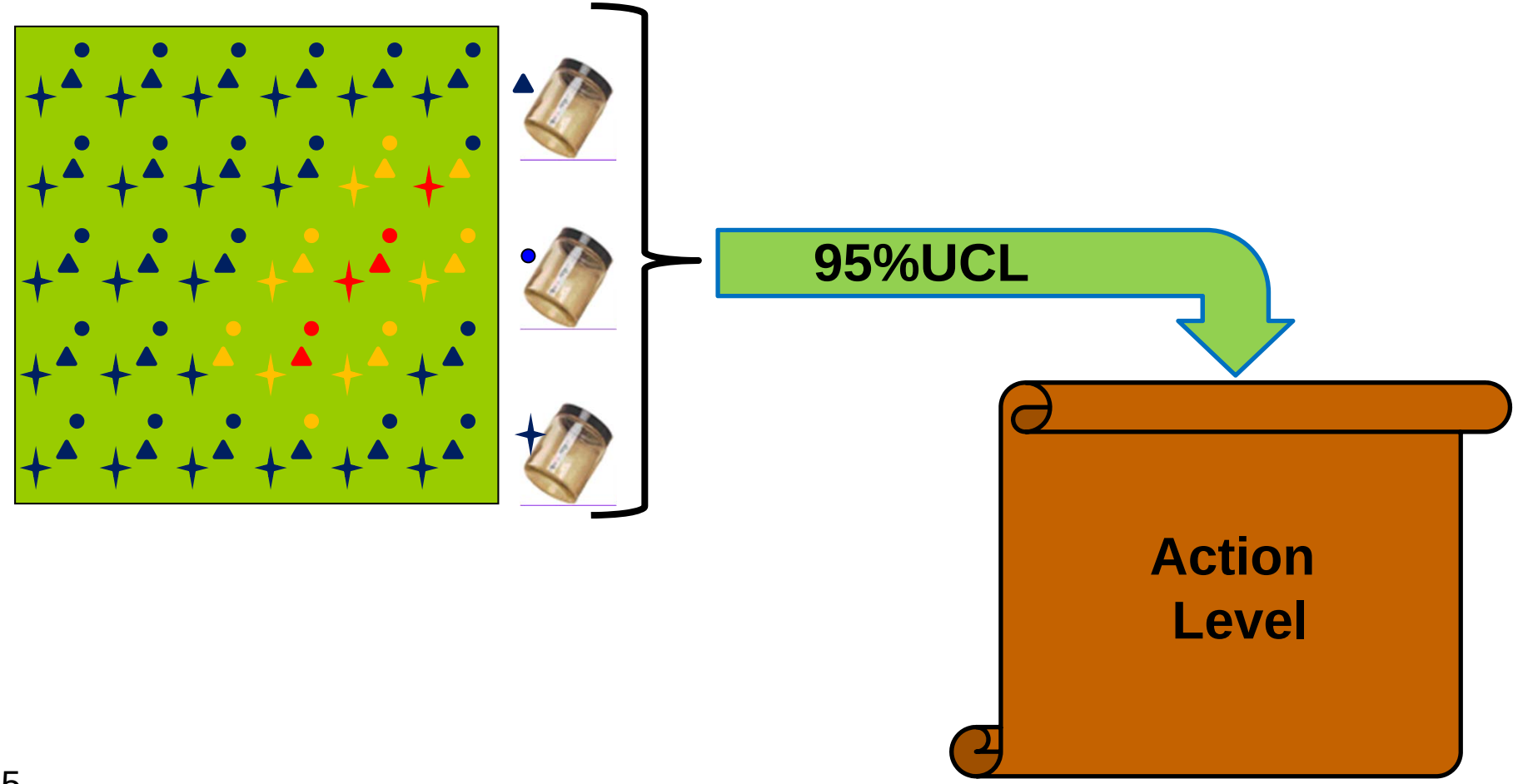
Compare 95% Upper Confidence Limit to Action Level

Decision Unit



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Regulatory Concerns

- Introduction
- Perception Issues
- Regulatory Challenges
- State of Knowledge, Experience and Training
- Implementation Issues

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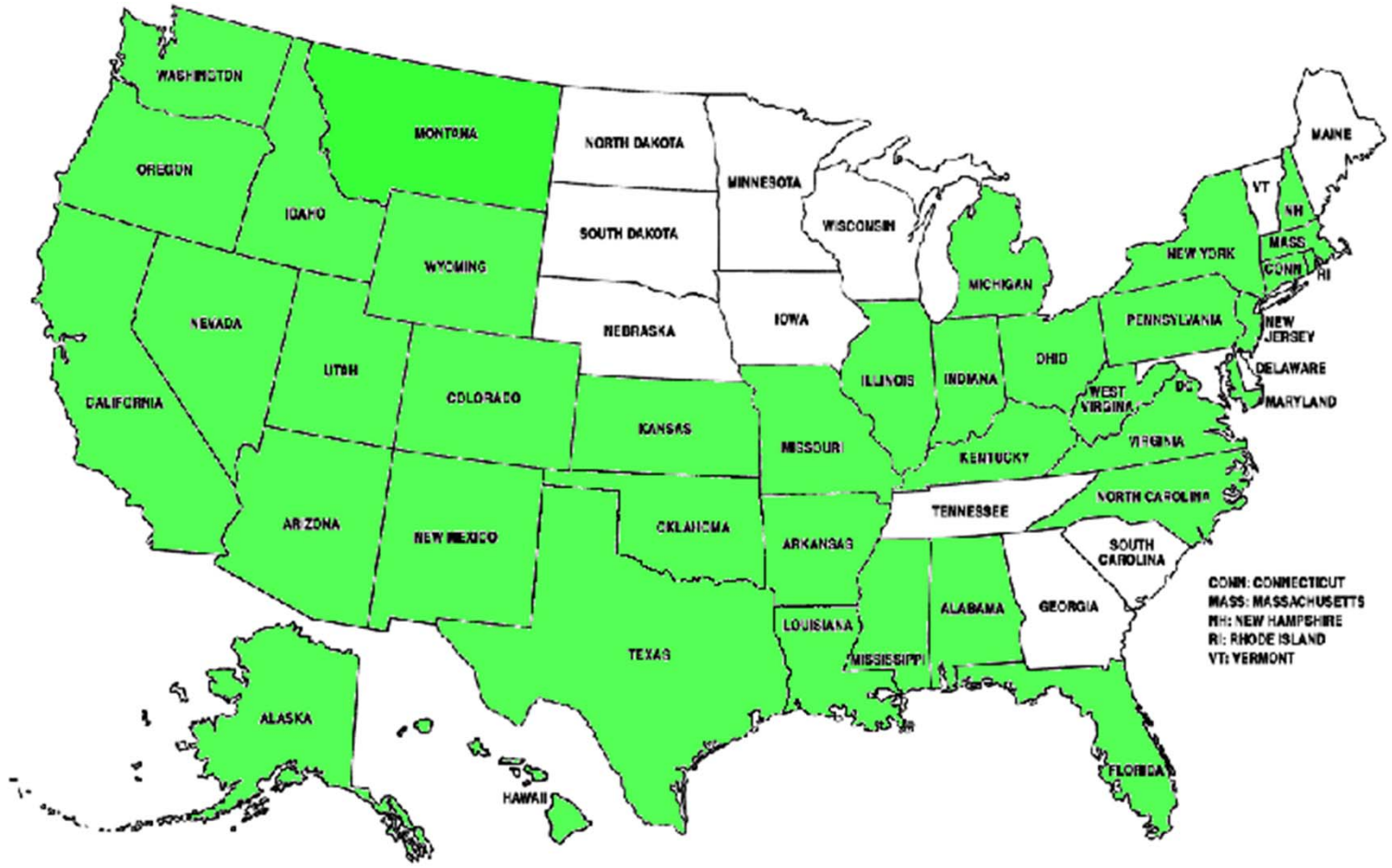
States with Incremental Sampling Projects



Use of ISM does not constitute state regulatory acceptance. Results based on ITRC ISM survey 2009

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Case Studies

- PCB Contaminated Landfill
- TCE Vadose Zone Investigations
- Petroleum Contaminated Soil Stockpile
- Uranium Enrichment Facility
- Former Golf Course Field Demonstration
- Hawaiian Homelands Development

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Guidance Document Projected Schedule

- Full ITRC (non-DoD) review – April 15, 2011
- DoD & EPA review – June 1, 2011
- Final to ITRC communications – Oct. 2011
- Web based guidance testing – Jan. 2012
- Tech. Reg. Publically Available – Feb. 2012

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